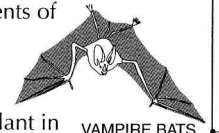
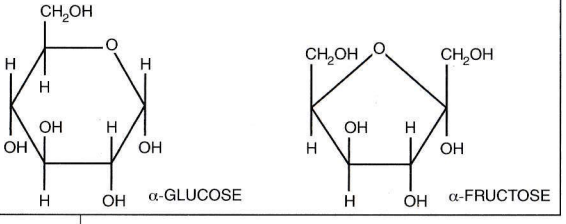
Functions of soluble carbohydrates include transport, protection, recognition and energy release.

Glucose is the most common substrate for respiration (energy release).
Fructose is a constituent of nectar and sweetens fruits to attract animals and aid seed dispersal.

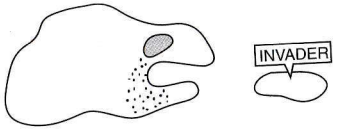
Sugar derivatives include *sugar alcohols,* e.g. glycerol, *sugar acids,* e.g. ascorbic acid, and *mucopolysaccharides,* which are important components of connective tissues, synovial fluid, cartilage and bone. Heparin (anticoagulant in blood) is derived from mucopolysaccharides and has a protective function.



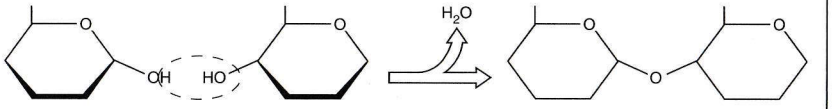
Glucose and fructose are both **monosaccharides** (single sugar units) with the typical formula $C_nH_{2n}O_n$. They each have **six carbon atoms** and are thus called **hexoses** (**pentoses** have 5 carbon atoms and **trioses** have 3).
Glucose and **fructose** are isomers of $C_6H_{12}O_6$.



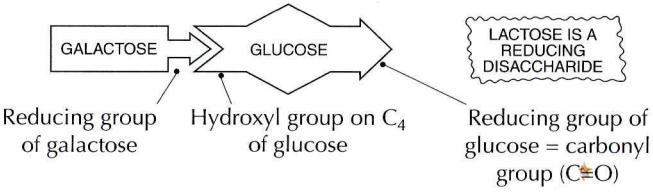
Oligosaccharides are short (often 6-12 units) condensation products which combine with protein (*glycoprotein*) or lipid (*glycolipid*) and form the outer coat (*glycocalyx*) of animal cells. They are important in *cell-cell recognition* and the *immune response.*



In naturally occurring **disaccharides** monosaccharide rings are joined together by *glycosidic bonds.*

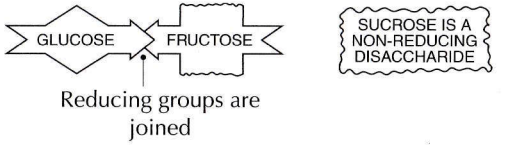


This most usually occurs between *aldehyde* or *keto group* (i.e. the reducing group) of one monosaccharide and an *hydroxyl group* of another monosaccharide, e.g. *lactose.*



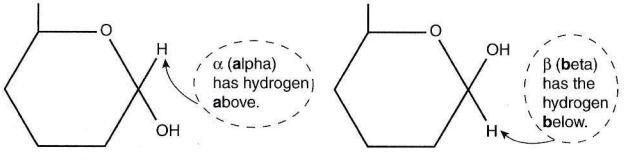
(*Maltose* is a reducing disaccharide formed from two molecules of α-glucose.)

More rarely it can happen between *reducing groups of adjacent monosaccharides,* e.g. *sucrose.*



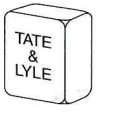
I. I F Soluble Carbohydrates

α-glucose and β-glucose are isomers. These two molecules only differ in the arrangement of –H and –OH at the first C atom in the 'ring'.



Lactose intolerance occurs in many adults. This results from a deficiency in *lactase* so that dietary lactose accumulates in the lumen of the small intestine. This lowers the water potential of the gut contents causing an influx of fluid into the small intestine - this results in abdomenal distension, nausea, pain and diarrhoea. The condition is much more common in adult populations for whom milk is an unusual or uncommon food.

Sucrose (*glucose-fructose*) is the main transport compound in plants. Commonly extracted from sugar cane and sugar beet and used as a sweetener.



Lactose (*glucose-galactose*) is the carbohydrate source for suckling mammals - milk is about 5% lactose.